ASSESSMENT OF LV MYOCARDIAL MASS IN CHILDREN: COMPARISON OF NUCLAR MAGNETIC RESONANCE IMAGING WITH CROSS SECTIONAL ECHOCARDIOGRAPHY.

Michael Vogel, Heiko Stern, Andrea Schimmer, Ursula Sauer, Konrad Bühlmeyer.
Dep. Pediatrics, Deutsches Herzzentrum München,Germany

Although LV mass may be important to judge effects of left heart obstruction or hypertension, reproducible noninvasively determined normal data in the pediatric age group are scarse.To validate cross sectional echocardiographic mass determination we compared our data to NMR derived mass, which was considered to be the gold standard, as there is no problem in defining endo-and epicardial borders with NMR.LV mass was assessed in 13 children , median age 2.6 (10 days - 14.7) years with a median body surface area of .7 (.25-1.61) m^2.With cross sectional echocardiography the epicardial and endocardial volume was calculated using a Simpsons rule algorithm in the apical two and four chamber view.The difference between epi- and endocardial volumes was multiplied by 1.05 to yield the mass.Echocardiographic mass data had been evaluated for interobserver variability, which was 4.7%.Validity of the echocardiographic method had also been established by comparing endsystolic and enddiastolic mass, which yielded a correlation coefficient of r=0.88 with a standard error of estimate of 5.9 gr or 9.8%.NMR mass was assessed using a multicycled slice technique, the area of each myocardial slice was calculated and multiplied with the slice thickness, the resultant slice volumes were added to obtain the myocardial volume.With cross sectional echocardiography the mass was 54.9 (11.5-126.4) g or 65 (46-84) g/m^2. and with NMR it was 60.1 (12.6-142.8) g or 69.6 (46-89) g/m^2. The regression analysis yielded an r value of .988 with a standard error of the estimate of 5.2 g or a 9 % difference.We conclude that cross sectional echocardiography can reliably assess LV myocardial mass in pediatric patients ranging from newborns to adolescents.

MYOCARDIAL CONTRAST WASHOUT REFLECTS CORONARY BLOOD FLOW IN THE ABSENCE OF CORONARY AUTOREGULATION

Daniele Rovai, Massimo Lombardi, Gianna Ghelardini, Maria Giovanna Trivella, Edoardo Nevola, Maria Aurora Morales, Luigi Taddei, Birgitta Bjurk, Antonio L'Abbate. CNR Clinical Physiology Institute, Pisa, Italy

Purpose of this study was to quantitate coronary blood flow (CBF) by myocardial contrast echocardiography. In order to minimize changes in myocardial "vascularity" due to variations in coronary tone, CBF was changed by modifying perfusion pressure during Adenosine intracoronary infusion.
In 5 open-chest anaesthetised dogs, the left circumflex coronary artery was cannulated and perfused with blood from the femoral artery by a roller pump. During Adenosine infusion (dose ranging from 0.6 to 1.8 mg/min such to assure maximal vasodilatation), radionuclide labelled microspheres and sonicated Iopamidol were injected into the cannula, at different levels of circumflex CBF. As assessed by microspheres CBF ranged between .7 and 12 ml/min/g. Echocardiographic images of the LV short axis were digitised for 20 consecutive seconds/injection and end-diastolic frames were sampled. Myocardial videodensity in the circumflex territory was measured to build time-intensity curves. The washout slope of curves showed a good correlation with microspheres CBF: r = .82, 40 observations, r in individual dogs ranging between .71 and .96. To minimize the errors due to the inter-injection variability (Standard Error of the Estimate 27 %), the washout slopes of two paired injections were averaged and flow prediction improved up to a correlation coefficient r = .88.
Thus, in absence of coronary autoregulation, myocardial echo contrast washout reflects changes in CBF.

Wednesday, March 6, 1991
Poster Displayed: 9:00AM–12:00NOON
Author Present: 10:00AM–11:00AM
Hall F, West Concourse
Echocardiography

IMPROVED DETECTION OF ENDOCARDIAL BORDERS USING CONTRAST ECHOCARDIOGRAPHY.

Folkert J. TenCate, Inge Zorn, Paul R. Silverman, Bas G. VanderBorden, Willem B. Vletter.
Thoraxcenter, Academic Hospital and Erasmus University Rotterdam, The Netherlands.

In a substantial number of patients quantitation of left ventricular volumes by two dimensional echocardiography is not useful. This is due to less optimal image quality since manual tracing of endocardial borders requires still frames. We tested the hypothesis whether an intravenous injection of a standardized echocontrast agent will improve endocardial border recognition and therefore also will improve accuracy of left ventricular volume measurements. Eleven healthy normal volunteers ($\bar{m}$ age:20 ± 3 yrs; weight: 68 ± 3 kg) had an intravenous injection of Albunex 0.04 ml/kg body weight. Twodimensional echocardiograms were made before, during and after injection until the left ventricular cavity was completely cleared of echocontrast. Video recorded images were analyzed using a floating reference system by manually tracing of enddiastolic (ED) and endsystolic (ES) sizes. This was done for beats without ⊖ and with ⊕ echocontrast opacification of left ventricular cavity. In nine of the eleven volunteers the anterolateral wall and anterolateral papillary muscle was better seen in the ⊕ beats. Left ventricular volumes were determined by a single plane disc method using Simpson's rule.

Results:		EDV (ml)	ESV (ml)
⊖	contrast	120 ± 29	59 ± 18
⊕	contrast	143 ± 28	68 ± 14

Mean of the differences (Δ) for EDV was 21.4 ± 25.6 ml with a 95% confidence interval varying between 10. and 32.7. Δ for ESV was 9.3 ± 19.3 ml with a 95% confidence interval varying between .7 and 17.9. Intra observer variability for ⊖ and ⊕ did not differ significantly.
Conclusion: 1. An intravenous echocontrast injection improves LV endocardial border detection visually. 2. Both EDV and ESV are larger with echocontrast. 3. The clinical value of better endocardial detection needs further studies since intra observer variability did not improve.

HIGH FREQUENCY ROTATIONAL ANGIOPLASTY INDUCED ECHOCARDIOGRAPHIC CONTRAST

Raimund Erbel, Peter Stähr, Ulli Dietz, Rainer Zotz, Rüdiger Brennecke, Jürgen Meyer
II. Medical Clinic, University Mainz, FRG

During high frequency rotational angioplasty (HFRA) myocardial echocardiographic contrast enhancement was observed by two-dimensional echocardiography. This echocontrast production was analyzed in an in vitro model consisting of a echogenic cylinder with the HFRA catheter in a water bath. The cylinder was filled with blood (B), mineral water (M), and destillated water (DW). Echocardiograms were recorded by 2.25 MHz transducers and analyzed by intensitometry calculating the peak intensity (IU max), the area under the curve (AUC) and the persistence time (P) produced by HFRA with rotation frequencies between 80.000 and 200.000 rpm for 10s using a 2.0 mm burr. For MW and DW the procedure was repeated in an additional model allowing hyperbaric conditions.

rpm	IUmax (IU)			AUC (IUs)			P(s)		
	B	MW	DW	B	MW	DW	B	MW	DW
80,000	65	17	5	914	188	9	12	13	3
120,000	230	130	16	2982	1494	146	14	20	6
160,000	223	156	22	2852	2358	207	19	24	11
200,000	237	-	72	4722	-	839	24	-	14

Peak intensity for B reached a maximum at 120,000 rpm with only further increase of echo contrast persistence time. With 0.5 bar echo contrast production was reduced and with 2.0 bar suppressed for MW and DW.
Conclusion:
HFRA produces transient echo contrast depending on fluid, frequency, and pressure as can be predicted by the Bernoulli equation. The speed at the burr surface exceeds the limit where solved gas extracavates into microcavitations.